

Patent Claims

1. Nonvolatile two-transistor semiconductor memory cell having

5 a memory transistor (ST) having a predetermined threshold voltage, which has a source and drain region (2) with a channel region lying in between in a substrate (1), a first memory transistor insulation layer (3), a charge storage layer (4), a second memory
10 transistor insulation layer (5) and a memory transistor control layer (6) being formed at the surface of the channel region; and
a selection transistor (AT) having a predetermined threshold voltage, which has a source and drain region
15 (2) with a channel region lying in between in the substrate (1), a first selection transistor insulation layer (3') and a selection transistor control layer (4*) being formed at the surface of the channel region, characterized in that
20 for the independent optimization of the threshold voltages (V_{th}) of the memory transistor (ST) and of the selection transistor (AT), the selection transistor control layer (4*) is formed differently from the charge storage layer (4).

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2. Nonvolatile two-transistor semiconductor memory cell according to Patent Claim 1,
characterized in that
the selection transistor control layer (4*) and the
30 charge storage layer (4) have a different material and/or a different doping.

3. Nonvolatile two-transistor semiconductor memory cell according to Patent Claim 1 or 2,

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characterized in that
the substrate (1) has a semiconductor material with a doping of the first conduction type (p),
the selection transistor control layer (4*) has a semiconductor material with a doping of the first

conduction type (p), and the charge storage layer (4) has a semiconductor material with a doping of the second conduction type (n), which doping is opposite to the first conduction type.

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4. Nonvolatile two-transistor semiconductor memory cell according to one of Patent Claims 1 to 3, characterized in that the dopant concentration of the first conduction type (p) is increased in the substrate (1), the channel regions or a well region.

5. Nonvolatile two-transistor semiconductor memory cell according to one of Patent Claims 1 to 4, characterized in that the first memory transistor insulation layer (3) and the first selection transistor insulation (3') have an SiO₂ layer.

6. Nonvolatile two-transistor semiconductor memory cell according to one of Patent Claims 1 to 5, characterized in that the charge storage layer (4) and the selection transistor control layer (4*) have a polysilicon layer and/or a metallic layer.

7. Nonvolatile two-transistor semiconductor memory cell according to one of Patent Claims 1 to 6, characterized in that the memory transistor (ST) and the selection transistor (AT) represent an NMOS and/or a PMOS transistor.

8. Method for fabricating a nonvolatile two-transistor semiconductor memory cell having the following steps:

a) formation of a first insulation layer (3, 3') for a selection transistor (AT) and a memory transistor (ST) on a semiconductor substrate (1), which has a doping of the first conduction type (p);

b) formation of a semiconductor layer (4) at the surface of the first insulation layer (3, 3'), which has a doping of the first conduction type (p) in a

region of the selection transistor (AT) and a doping of the second conduction type (n), which doping is opposite to the first conduction type, in a region of the memory transistor (ST);

- 5 c) formation of a second insulation layer (5) at the surface of the electrically conductive semiconductor layer (4) at least in the region of the memory transistor (ST);
- d) formation of a further electrically conductive
- 10 layer (6) at the surface of the second insulation layer (5) at least in the region of the memory transistor (ST);
- e) formation and patterning of a mask layer (7);
- f) formation of layer stacks in the region of the
- 15 selection transistor (AT) and of the memory transistor (ST) using the patterned mask layer (7); and
- g) formation of source and drain regions (2) with a doping of the second conduction type (n) using the layer stack as mask.

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9. Method according to Patent Claim 8, characterized in that, in step a), a semiconductor substrate (1) with increased basic doping, well doping and/or surface doping of the first conduction type (p)
- 25 is used.

10. Method according to either of Patent Claims 8 or 9, characterized in that, in step a), a tunnel oxide layer
- 30 (TOX) is formed in the region of the memory transistor (ST) and a gate oxide layer (GOX) is formed in the region of the selection transistor (AT).

11. Method according to one of patent Claims 9 to 10, characterized in that, in step b), a polysilicon layer
- 35 is deposited and the different doping in the region of the selection transistor (AT) and of the memory transistor (ST) is effected by a masked implantation.

12. Method according to one of Patent Claims 9 to 11, characterized in that, in step c), an ONO layer sequence is formed.
- 5 13. Method according to one of Patent Claims 9 to 12, characterized in that, in step d), a further polysilicon layer is deposited, which has a doping of the second conduction type (n).
- 10 14. Method according to one of Patent Claims 9 to 13, characterized in that, in step e), a hard mask layer is formed.
- 15 15. Method according to one of Patent Claims 9 to 14, characterized in that, in step f), an anisotropic etching method is carried out.
- 20 16. Method according to one of Patent Claims 9 to 15, characterized in that, in step g), an ion implantation (I) is carried out.